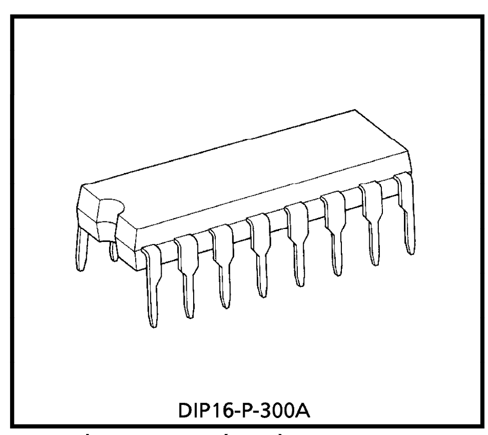
TA7628P, TA7628HP

SILICON MONOLITHIC

AMPLIFIER SYSTEM FOR CASSETTE TAPE RECORDER

TA7628P and TA7628HP are Pre + Power amplifier system designed for cassette tape recorder.

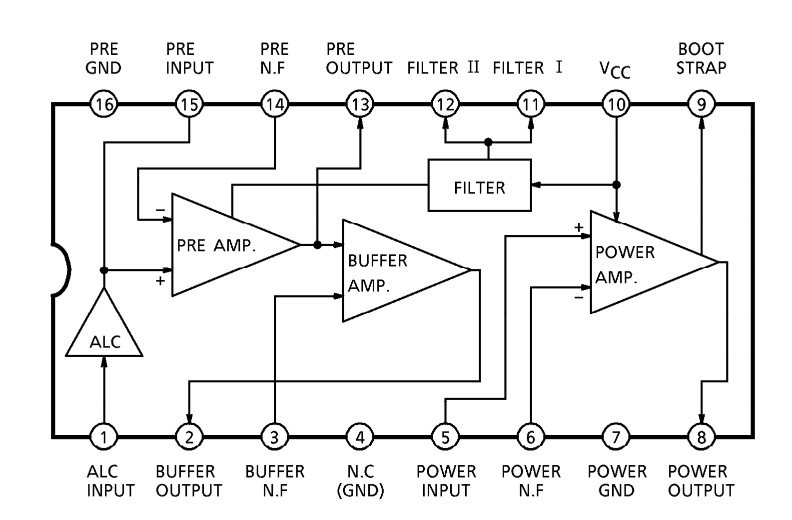


Weight : 1.00g (Typ.)

FEATURES

- Recording Playback for Pre Amplifier
- Buffer Amplifier (Recording Amplifier)
- Power Amplifier
- ALC Detector Circuit
- Muting Circuit
- Maximum Output Power (V_{CC} = 6V, f = 1kHz, THD = 10%)
  : P_{out} = 0.6W (Typ.) (R_L = 8Ω) : TA7628P
  : P_{out} = 0.96W (Typ.) (R_L = 4Ω) : TA7628HP
- Low Distortion and Wide Dynamic Range
- Without Turn-on "POP" for Muting Circuit
- Operating Supply Voltage Range
  : $V_{CC\,(opr)}$ = 3.5~9V (Ta = 25°C)

BLOCK DIAGRAM



SWITCH OVER

TEST ITEM	SW_1	SW_2	SW_3	SW_4	SW_5	SW_6
G_{vo1}	1	1	ON	OFF	OFF	OFF
G_{v1}	1	1	OFF	OFF	OFF	OFF
V_{out1}	1	1	OFF	OFF	OFF	OFF
G_{v2}	1	3	OFF	OFF	OFF	OFF
V_{out2}	1	3	OFF	OFF	OFF	OFF
V_{no2}	1	3	OFF	OFF	ON	OFF
ALC	1	2	OFF	OFF	OFF	OFF
G_{vo3}	2	1	OFF	ON	OFF	OFF
G_{v3}	2	1	OFF	OFF	OFF	OFF
P_{out}	2	1	OFF	OFF	OFF	OFF
V_{no3}	2	1	OFF	OFF	OFF	ON

PRECAUTION FOR USE

1. Precaution of GND line

   The GND points of input side GND and N.F side GND in each amplifier must be arranged at the preamplifier side. (Fig.1)
   The input side GND point and the N.F side GND point must be arranged near each other to have no impedance.

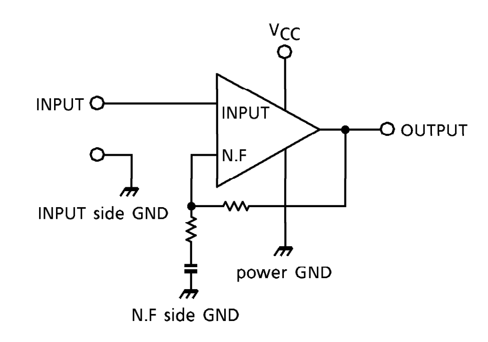


Fig.1

2. About radiation
   1) The capacitance between the output and GND in preamplifier, buffer amplifier and power amplifier must be arranged near to this IC. The radiation loop must be as small as possible.
   2) The voltage gain of high frequency in each amplifier must be reduced to reduce the noise with high frequency component. (In the application circuit, the feed back capacitor is used)
      A 1000pF or same order capacitor must be connected from the input terminal of preamplifier and power amplifier to GND to prevent the interference of radiation.
   3) It is better for this IC to separate adequately from the antenna in the radio cassette tape recorder applications.
   4) The electrolytic capacitance 100μF~220μF between V_{CC} and GND must be arranged near to this IC.
3. To prevent the oscillation
   1) The output terminal of preamplifier must be terminated to GND by the capacitance more than 5600pF.
      (The recommended value : C = 0.01μF)
   2) The output terminal of buffer amplifier must be terminated to GND by the capacitance more than 0.01μF.
      (The recommended value : C = 0.01μF)
   3) The output terminal of power amplifier must be terminated to GND by the good temperature characteristic capacitance of 1~2.2μF. The bootstrap terminal must be terminated to GND with the capacitance more than 0.47μF.
4. Precaution of preamplifier
   1) It is better that the coupling capacitor between the volume and the output of preamplifier is small.
      Recommended value : C = 0.47μF
   2) In recording mode, the signal source resistance must be more than 1kΩ for ALC (Automatic Level Control) operation. When this resistance is small, the ALC range becomes narrow.

5. Buffer amplifier

When the output signal is clipped in the buffer amplifier, this signal returns to preamplifier and influences to make THD bad.
To prevent this, in playback mode, the buffer amplifier is recommended to be cut-off by terminating the output terminal to GND directly or by terminating the feedback terminal to GND through 330Ω or less than this shown in Fig.2.

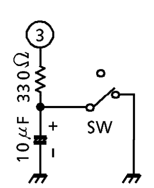


Fig.2

6. Power amplifier

1) In case of the battery use (V_{CC} ≦ 6V), this IC is happen to oscillate (blocking oscillation) when the impedance of power supply is high. In this case, it is recommended to insert the resistance R_A of 500Ω～1kΩ between ⑩pin and ⑫pin (V_{CC} – Filter II). By this method, this IC becomes very stable. But the output DC voltage is not center by the influence of R_A. Then the output wave shape is not symmetrical clipping wave and the maximum output voltage is reduced. So we recommend to insert the other resistance R_B between ⑥pin and ⑧pin for compensating the output DC voltage.

2) When you use this IC at the supply voltage of more than 6V, it is better to insert the resistance R_B for compensating output DC voltage. (Fig.3)
The recommended value : R_B = 220kΩ at V_{CC} = 7.5V
R_B = 150kΩ at V_{CC} = 9V

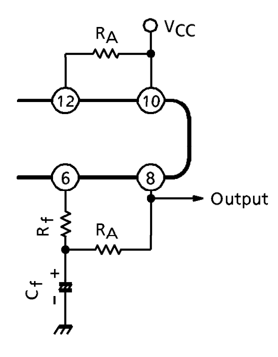


Fig.3

3) The output coupling capacitance and bootstrap capacitance is better to be large because of getting the maximum output power.

4) On the PC board, the interval between V_{CC} and GND is better to be large.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage	TA7628P	V_{CC}	9	V
	TA7628HP		12	
Output Current	TA7628P	$I_{O\ (peak)}$	0.56	A
	TA7628HP		1.5	
Power Dissipation	TA7628P	P_D (Note)	750	mW
	TA7628HP		1200	
Operating Temperature		T_{opr}	– 20～75	°C
Storage Temperature		T_{stg}	– 55～150	°C

(Note) Derated above Ta = 25°C in the proportion, 6.0mW / °C for TA7628P, 9.6mW / °C for TA7628HP.

ELECTRICAL CHARACTERISTICS (TA7628P) (Unless otherwise specified, $V_{CC} = 6V$, f = 1kHz, Ta = 25°C)

TOTAL

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	$I_{CCQ\ (1)}$	—	$V_{CC} = 3.5V$	7	—	—	mA
Quiescent Current	$I_{CCQ\ (2)}$	—	$V_{CC} = 6V$	9	—	36	mA

PRE AMP.

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Open Loop Voltage Gain	G_{vo1}	—	—	55	70	—	dB
Closed Loop Voltage Gain	G_{v1}	—	—	—	40	—	dB
Maximum Output Voltage	V_{out1}	—	THD = 1%	—	0.7	—	V_{rms}
Input Resistance	R_{IN1}	—	—	24	30	—	kΩ
Equivalent Input Noise Voltage	V_{ni}	—	$R_g = 0$	—	1.4	2.5	μV_{rms}

PRE AMP. + BUFFER AMP.

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Closed Loop Voltage Gain	G_{v2}	—	Pre amp. $G_V = 40dB$ Buffer amp. $G_V = 20dB$	—	60	—	dB
Maximum Output Voltage	V_{out2}	—	THD = 3%	1.5	1.7	—	V_{rms}
Output Noise Voltage	V_{no2}	—	$R_g = 0$, $G_{V2} = 60dB$	—	1.2	2.5	mV_{rms}
ALC Effect	ALC1	—	$V_{in} = 0.775mV_{rms}$ (−60dBm) ~$0.0775V_{rms}$ (−20dBm)	—	2	—	dB
ALC Range	ALC2	—	Range of THD ≦ 1%	—	60	—	dB

POWER AMP.

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Open Loop Voltage Gain	G_{vo3}	—	—	60	70	—	dB
Closed Loop Voltage Gain	G_{v3}	—	—	—	40	—	dB
Output Power	P_{out}	—	$R_L = 8\Omega$, THD = 10%	0.5	0.6	—	W
Output Noise Voltage	V_{no3}	—	$R_g = 0$, $G_V = 40dB$	—	0.3	1.0	mV_{rms}

ELECTRICAL CHARACTERISTICS (TA7628HP) (Unless otherwise specified, V_{CC} = 6V, f = 1kHz, Ta = 25°C)

TOTAL

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	$I_{CCQ (1)}$	—	V_{CC} = 3.5V	7.5	—	—	mA
Quiescent Current	$I_{CCQ (2)}$	—	V_{CC} = 6V	11	—	35	mA

PRE AMP.

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Open Loop Voltage Gain	G_{vo1}	—	—	55	70	—	dB
Closed Loop Voltage Gain	G_{v1}	—	—	—	40	—	dB
Maximum Output Voltage	V_{out1}	—	THD = 1%	—	0.7	—	V_{rms}
Input Resistance	R_{IN1}	—	—	—	30	—	kΩ
Equivalent Input Noise Voltage	V_{ni}	—	R_g = 0	—	1.4	2.5	μV_{rms}

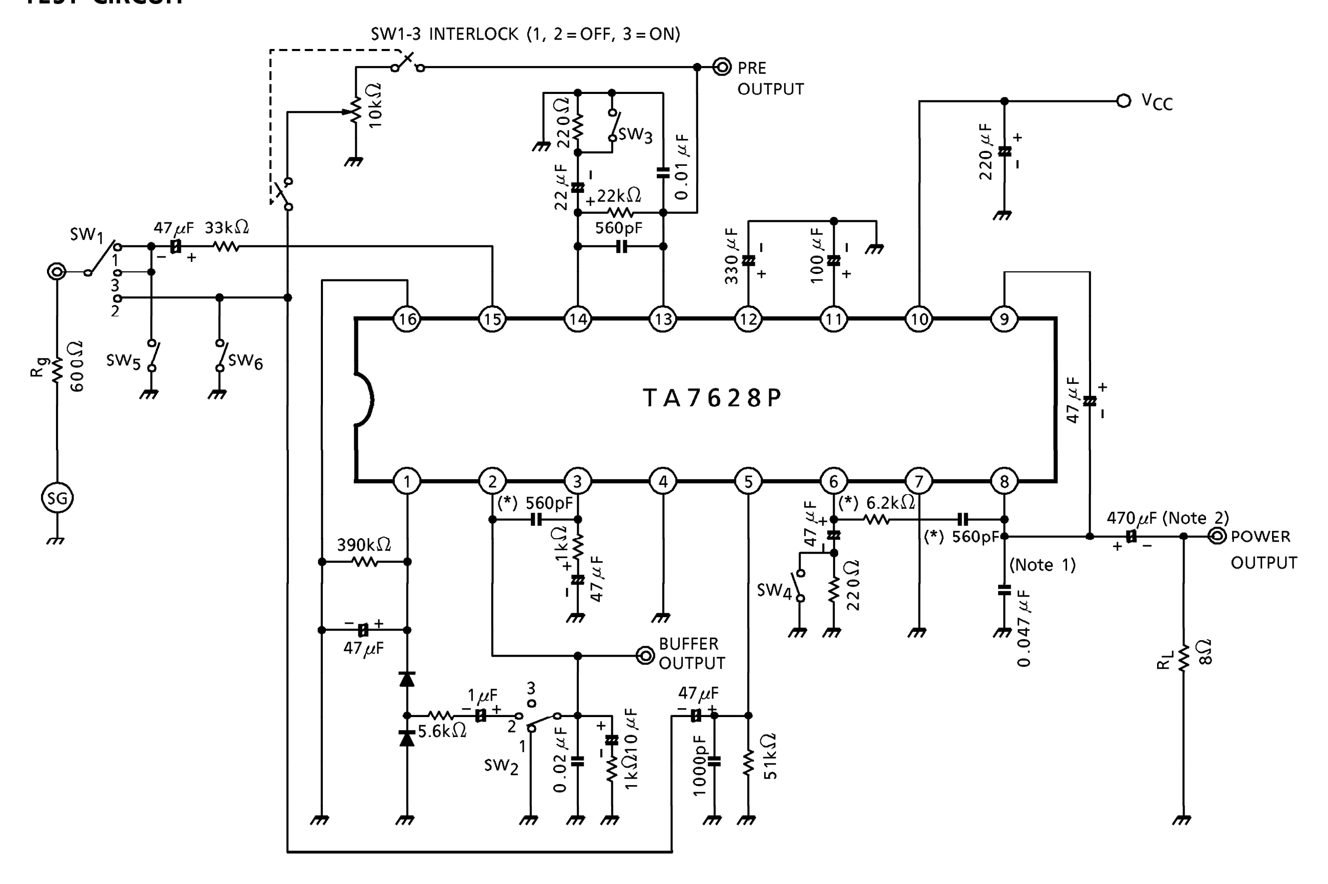
PRE AMP. + BUFFER AMP.

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Closed Loop Voltage Gain	G_{v2}	—	Pre amp. G_v = 40dB Buffer amp. G_v = 20dB	—	60	—	dB
Maximum Output Voltage	V_{out2}	—	THD = 3%	1.5	1.7	—	V_{rms}
Output Noise Voltage	V_{no2}	—	R_g = 0, G_{v2} = 60dB	—	1.2	2.5	mV_{rms}
ALC Effect	ALC1	—	V_{in} = 0.775mV_{rms} (−60dBm) ~0.0775V_{rms} (−20dBm)	—	2	—	dB
ALC Range	ALC2	—	Range of THD ≦ 1%	—	60	—	dB

POWER AMP.

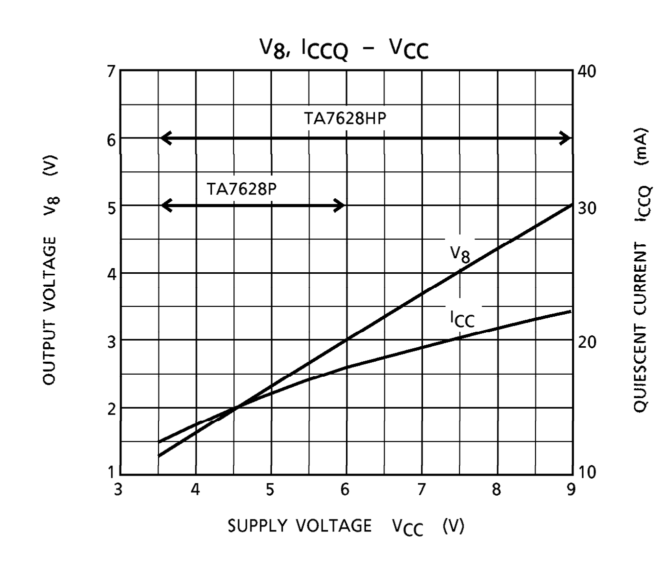
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Open Loop Voltage Gain	G_{vo3}	—	—	60	70	—	dB
Closed Loop Voltage Gain	G_{v3}	—	—	—	40	—	dB
Output Power	P_{out}	—	R_L = 4Ω, THD = 10%	0.8	0.96	—	W
			V_{CC} = 9V, R_L = 8Ω, THD = 10%	—	1.4	—	
Output Noise Voltage	V_{no3}	—	R_g = 0, G_v = 40dB	—	0.3	1.0	mV_{rms}

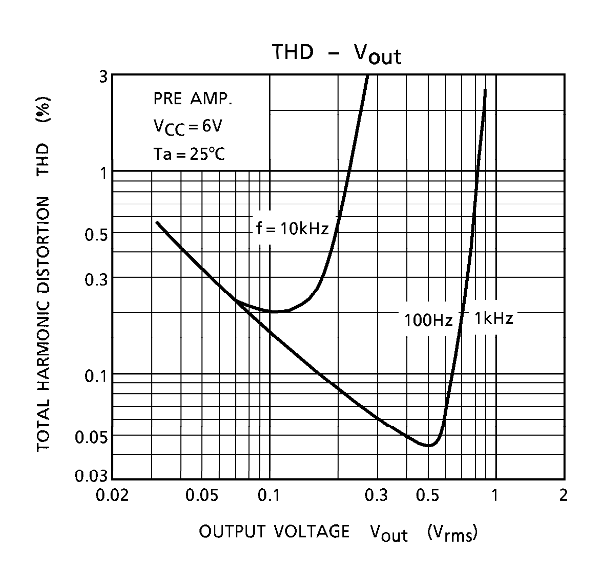
TEST CIRCUIT

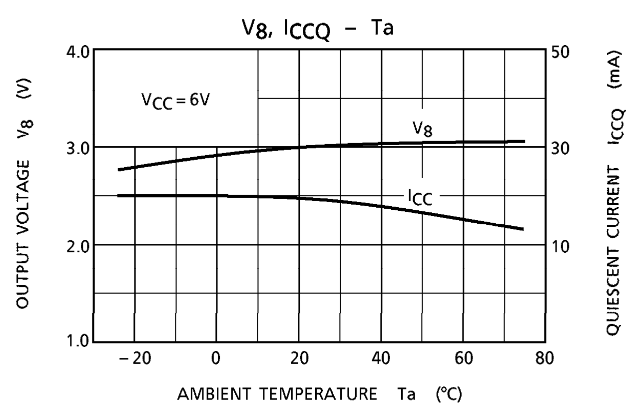


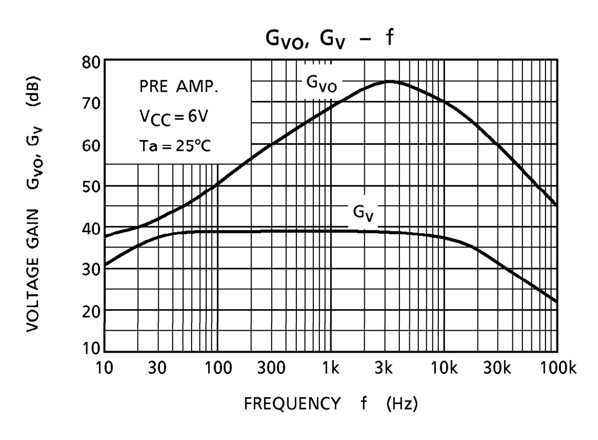
(*) Use in measuring the output noise voltage.

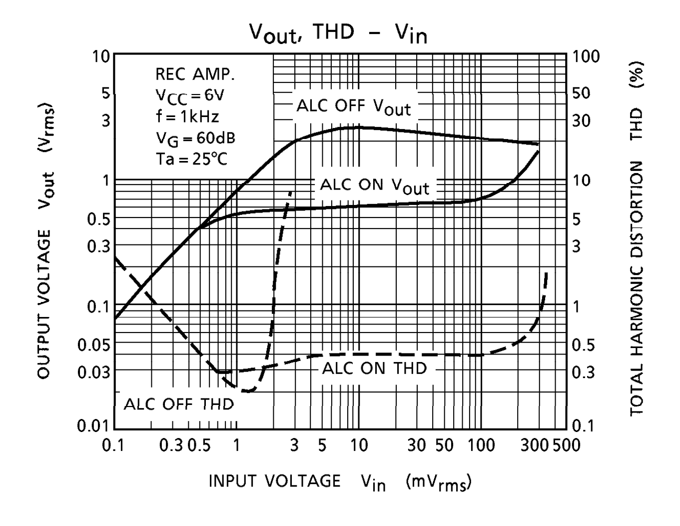
(Note 1) TA7628HP : 0.047μF → 0.068μF
(Note 2) TA7628HP : 470μF → 1000μF

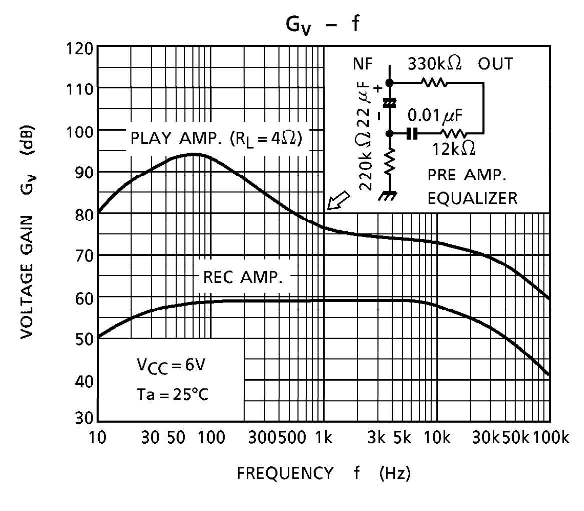

V8, ICCQ – VCC
TA7628HP
TA7628P
V8
ICC
OUTPUT VOLTAGE V8 (V)
QUIESCENT CURRENT ICCQ (mA)
SUPPLY VOLTAGE VCC (V)

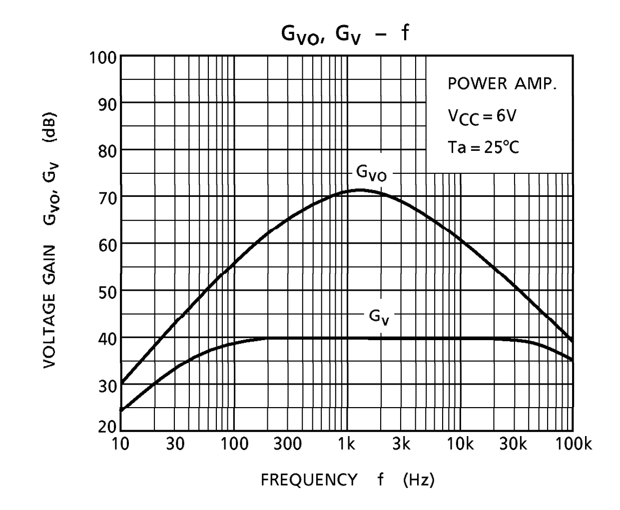

THD – Vout
PRE AMP.
VCC = 6V
Ta = 25°C
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT VOLTAGE Vout (Vrms)

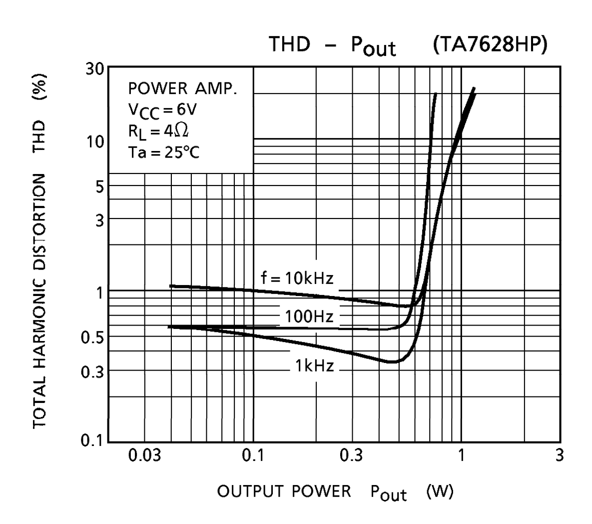

V8, ICCQ – Ta
VCC = 6V
V8
ICC
OUTPUT VOLTAGE V8 (V)
QUIESCENT CURRENT ICCQ (mA)
AMBIENT TEMPERATURE Ta (°C)

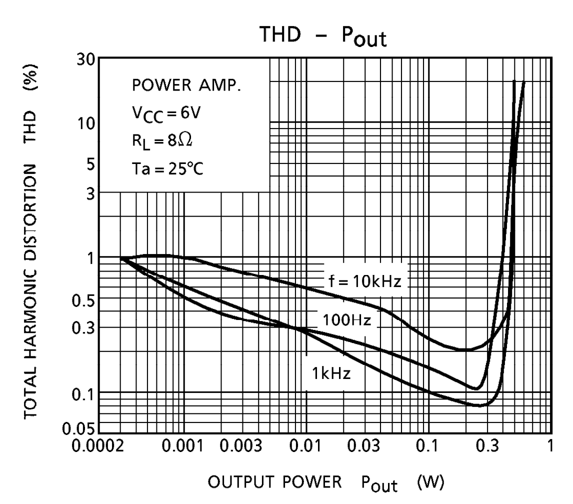

GVO, GV – f
PRE AMP.
VCC = 6V
Ta = 25°C
GVO
GV
VOLTAGE GAIN GVO, GV (dB)
FREQUENCY f (Hz)

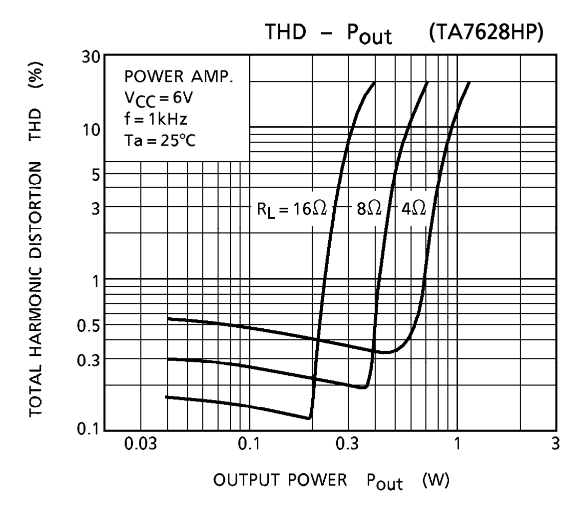

Vout, THD – Vin
REC AMP.
VCC = 6V
f = 1kHz
VG = 60dB
Ta = 25°C
ALC OFF Vout
ALC ON Vout
ALC ON THD
ALC OFF THD
OUTPUT VOLTAGE Vout (Vrms)
TOTAL HARMONIC DISTORTION THD (%)
INPUT VOLTAGE Vin (mVrms)

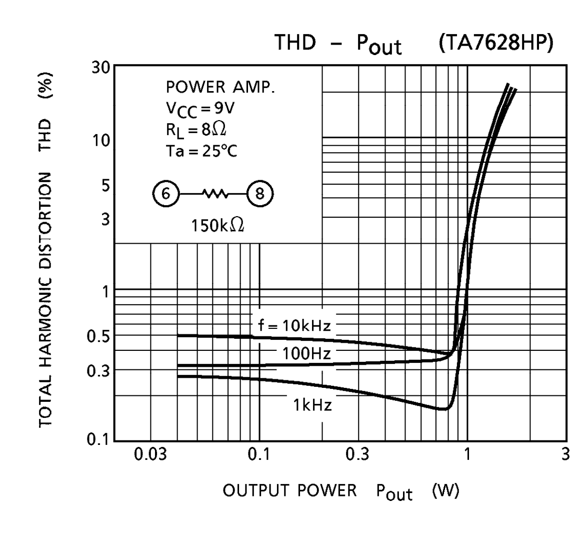

GV – f
NF
330kΩ
OUT
22μF
0.01μF
220kΩ
12kΩ
PRE AMP.
EQUALIZER
PLAY AMP. (RL = 4Ω)
REC AMP.
VCC = 6V
Ta = 25°C
VOLTAGE GAIN GV (dB)
FREQUENCY f (Hz)

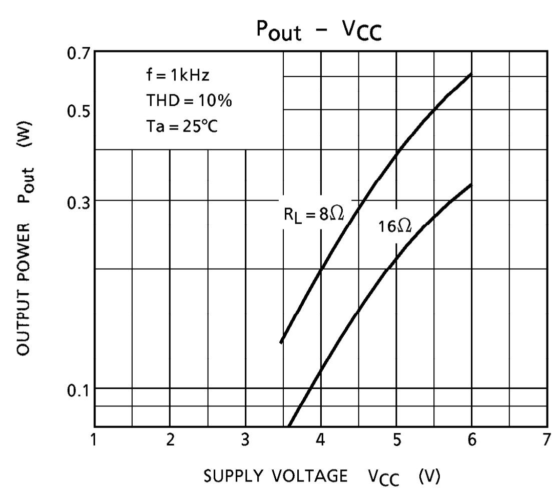

GVO, GV – f
POWER AMP.
VCC = 6V
Ta = 25°C
GVO
GV
VOLTAGE GAIN GVO, GV (dB)
FREQUENCY f (Hz)

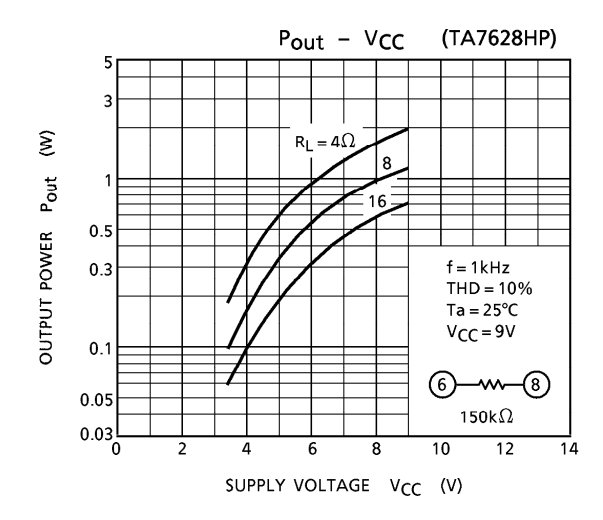

THD – Pout (TA7628HP)
POWER AMP.
VCC = 6V
RL = 4Ω
Ta = 25°C
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)

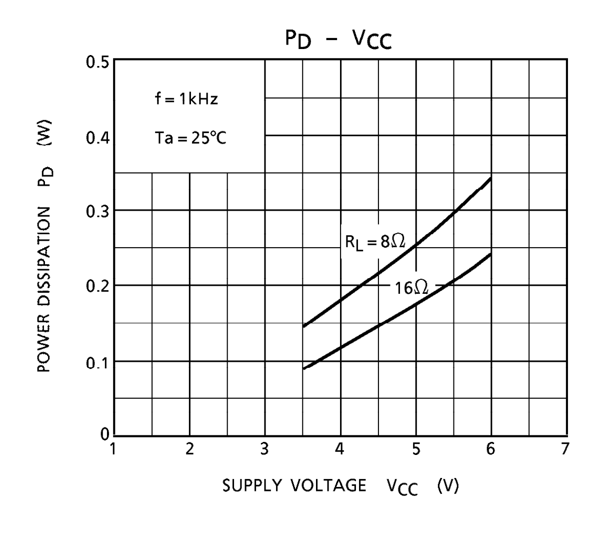

THD – Pout
POWER AMP.
VCC = 6V
RL = 8Ω
Ta = 25°C
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)

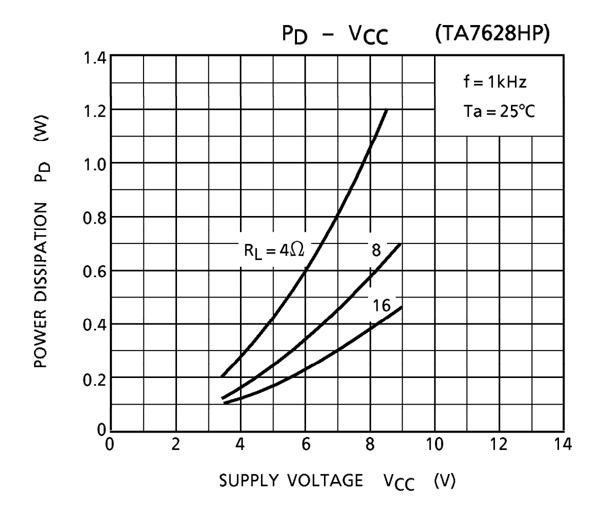

THD – Pout (TA7628HP)
POWER AMP.
VCC = 6V
f = 1kHz
Ta = 25°C
RL = 16Ω
8Ω
4Ω
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)

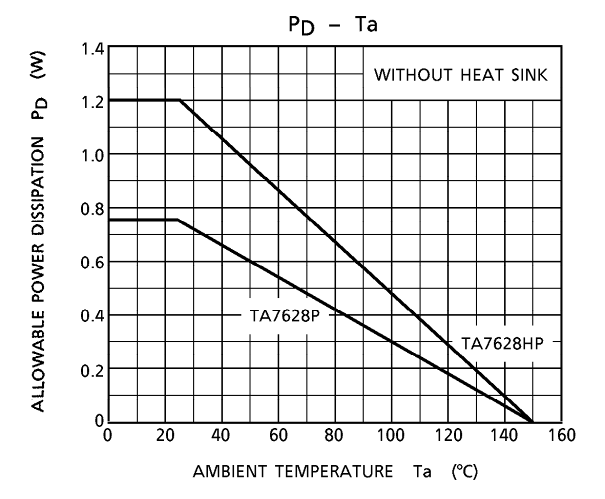

THD – Pout (TA7628HP)
POWER AMP.
VCC = 9V
RL = 8Ω
Ta = 25°C
6
8
150kΩ
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)


Pout – VCC
f = 1kHz
THD = 10%
Ta = 25°C
RL = 8Ω
16Ω
OUTPUT POWER Pout (W)
SUPPLY VOLTAGE VCC (V)

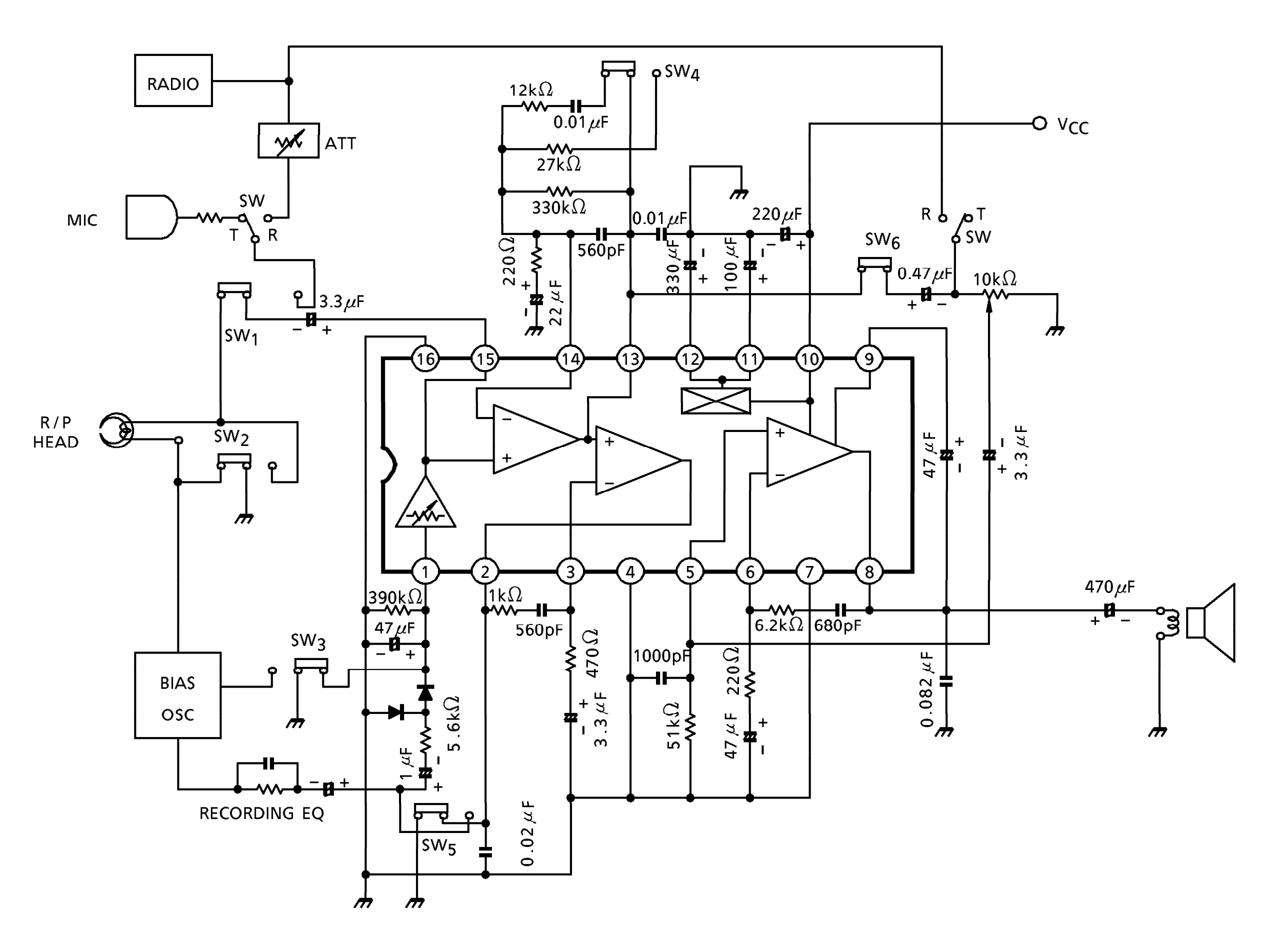

Pout – VCC (TA7628HP)
OUTPUT POWER Pout (W)
SUPPLY VOLTAGE VCC (V)
RL = 4Ω
8
16
f = 1kHz
THD = 10%
Ta = 25°C
VCC = 9V
6
8
150kΩ


PD – VCC
POWER DISSIPATION PD (W)
SUPPLY VOLTAGE VCC (V)
f = 1kHz
Ta = 25°C
RL = 8Ω
16Ω

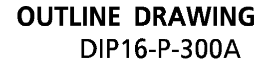

PD – VCC (TA7628HP)
POWER DISSIPATION PD (W)
SUPPLY VOLTAGE VCC (V)
f = 1kHz
Ta = 25°C
RL = 4Ω
8
16


PD – Ta
ALLOWABLE POWER DISSIPATION PD (W)
AMBIENT TEMPERATURE Ta (°C)
WITHOUT HEAT SINK
TA7628P
TA7628HP

APPLICATION CIRCUIT

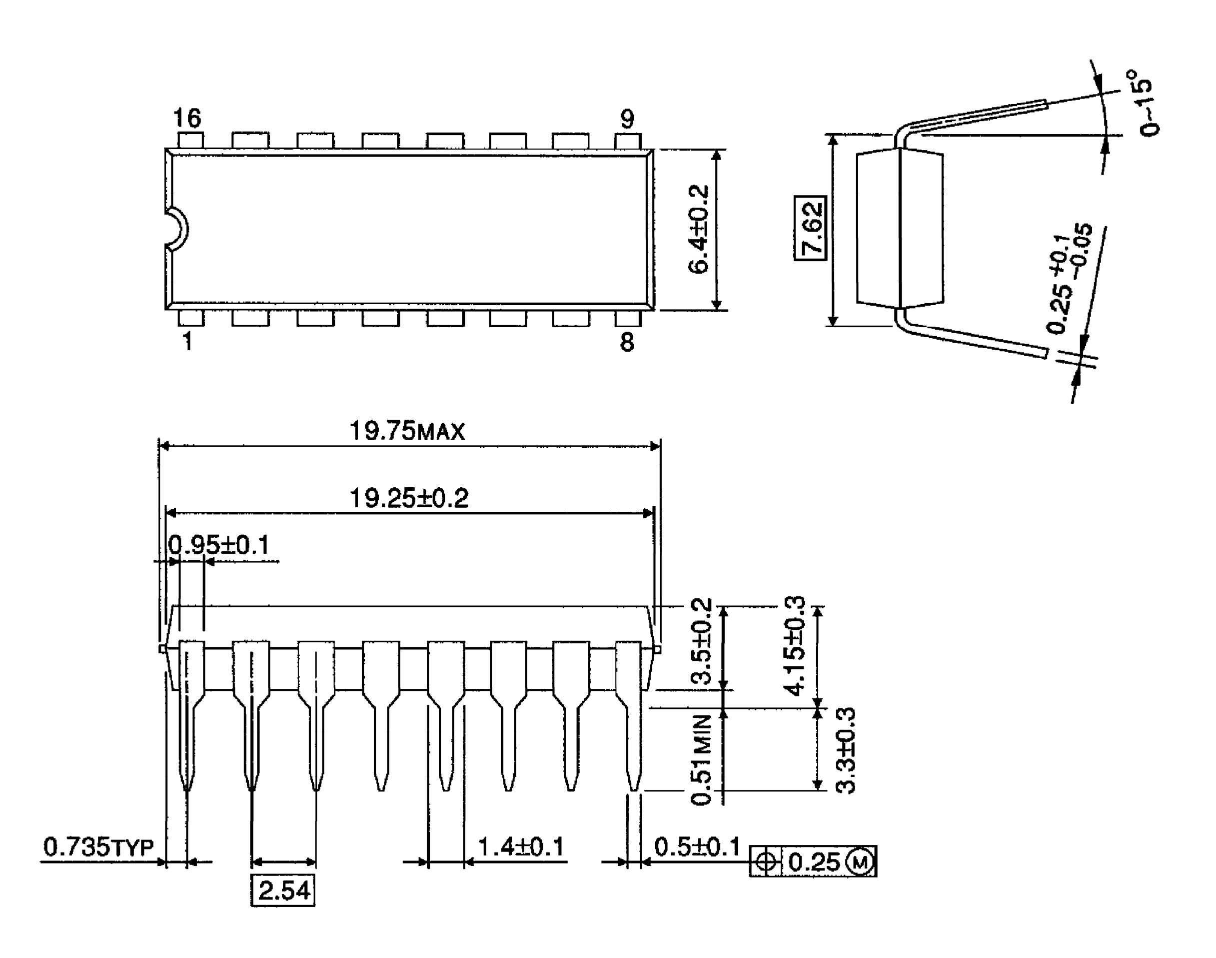


$SW_1 \sim SW_6$ are set for play back.
SW Functions.



OUTLINE DRAWING
DIP16-P-300A

Unit : mm



Weight : 1.00g (Typ.)